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A new species of *Charinus* from Minas Gerais State, Brazil, with comments on its sexual dimorphism (Arachnida: Amblypygi: Charinidae)

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Abstract. A new species of the genus *Charinus* Simon 1892 from the state of Minas Gerais, Brazil, is described. *Charinus jibaossu* sp. n. is morphologically close to *C. mysticus* Giupponi & Kury 2002 and shows both a marked secondary sexual dimorphism in the pedipalps and an interesting polymorphism in the spines of the distitarsus. The new species is endangered because it inhabits a region highly impacted by mining activities.

Keywords: Caves, neotropics, taxonomy, whip spiders

Amblypygi is an order of Arachnida distributed in tropical and subtropical ecosystems and comprises five families, 17 genera, and 164 living species, as well as nine described fossil species (Harvey 2003, 2013; Zhang 2013). The greatest diversity of Amblypygi occurs in the Neotropical region, which has about 100 described species (Harvey 2013). These species are represented in the Neotropics by the genera *Charinus* Simon 1892 of the family Charinidae, *Acanthophrynus* Kraepelin 1899, *Heterophrynus* Pocock 1894, *Paraphrynus* Moreno 1940, and *Phrynus* Lamarck 1801 belonging to the family Phrynidae, and *Trichodamon* Mello-Leitão 1935 belonging to the family Phrynichidae. With the exception of *Charinus* and *Phrynus*, these genera occur exclusively in the New World (Harvey 2002, 2003, 2013). Although *Phrynus* is mostly restricted to the Americas, one species inhabits Indonesia (Harvey 2002).

Charinus has approximately 50 species distributed worldwide mostly in tropical and subtropical regions (Weygoldt 2000; Jocqué & Giupponi 2012). In Brazil, ten species have been described for the genus, which are located in the northern region of the country: *C. vulgaris* Miranda & Giupponi 2011; Northeast: *C. potiguar* Vasconcelos et al. 2013, *C. acaraje* Pinto-da-Rocha et al. 2002, *C. mysticus* Giupponi & Kury 2002, and *C. troglobius* Baptista & Giupponi 2002; and Southeast: *C. asturius* Pinto-da-Rocha et al. 2002, *C. brasilianus* Weygoldt 1972, *C. montanus* Weygoldt 1972, *C. eleonorae* Baptista & Giupponi 2003, and *C. schirchii* (Mello-Leitão 1931), whose type has been lost and thus is considered to be a *nomen dubium* (Pinto-da-Rocha et al. 2002).

Herein we describe a new species of *Charinus* from caves of the speleological province of Arcos/Pains/Doresópolis (Minas Gerais, Brazil), one of the most important karst areas of the country. We also comment on the remarkable sexual dimorphism of the species.

METHODS

The specimens were collected through visual searching of the floors and walls throughout the caves. All specimens were captured with a fine brush and placed in vials containing 70% ethanol.

For nomenclature and measurements, we generally followed the proposals of Quintero (1981). The names of the gonopod structures of males followed Giupponi & Kury (2013). The article called tarsus by Quintero (1981) is divided here into the distitarsus and claw, as there is no fusion of these two segments in Charinidae. The spines of the pedipalpal tibia and teeth of the chelicerae are counted from the apex to the base. Measurements of the articles of the pedipalp were taken between the condyles of each segment in order to establish fixed points and adequate length measurements. We took measurements of the entire type series (quantity indicated as "n"), presenting first their mean values, followed by the range of variation in parentheses.

Illustrations of the genitalia were made through a camera lucida coupled to a Leica MDLS phase contrast microscope. We prepared other illustrations using a camera lucida attached to a Nikon SMZ-10 stereomicroscope. Photographs were made using a Leica M205A stereomicroscope with the software Leica Application Suite Automontage. To make Scanning Electron Microscope images, we dried the genitalia by transfer through an alcohol series (70%, 80%, 90%, and 100%) and submitted them to critical point drying. After that, the genitalia were placed on stubs, sputter coated and viewed in a JEOL–JSM–6390–LV scanning electron microscope.

The holotype and paratypes were deposited in the Museu Nacional, Rio de Janeiro, Brazil (MNRJ), and paratypes in the Seção de Invertebrados Subterrâneos, Collection of Zoology of the Universidade Federal de Lavras, Minas Gerais, Brazil (ISLA), in the Museu de Zoologia da Universidade de São Paulo (MZUP) and Wingless Arthropods Vectors of Importance in Comunities' Health Collection (CAVAISC), Oswaldo Cruz Institute, FIOCRUZ, Rio de Janeiro, Brazil.

Additional material examined.—*Charinus acaraje*: 4 females: Brazil, Bahia, Gruta Pedra do Sino, Santa Luzia (ISLA 3843, ISLA 3844, ISLA 3845, ISLA 3846); 1 female: Brazil, Bahia, Gruta Lapão de Santa Luzia (new record), Santa Luzia (ISLA 3840).

Charinus vulgaris: Female holotype: Brazil, Rondônia, Porto Velho, Bairros São João Bosco, Rio Madeira and Santo Antônio (MNRJ 09106).

Charinus bromeliaea Jocqué & Giupponi 2012: Female holotype, French Guyana, Savanna Roche La Virginie (MNRJ 09185).

Charinus potiguar: Male holotype: Brazil, Rio Grande do Norte, Felipe Guerra, Caverna do Buraco Redondo (MNRJ 09216).

Charinus mysticus: Female holotype: Brazil, Bahia, Caverna Encantados, Gentil do Ouro (MNRJ 9074), 16 km from Santo Inácio, road to Gameleira (cave with stream, about 8 m from entrance).

TAXONOMY

Family Charinidae Quintero 1986
Genus *Charinus* Simon 1892

Charinus Simon 1892:48. Full synonymy: see Harvey (2013).

Type species.—*Phrynus australianus* L. Koch 1867, by original designation.

Diagnosis.—*Charinus jibaossu* differs from other species of the genus by having the frontal process longer than wide with a pointed apex; median and lateral eyes developed; claw of the chelicera with 12 denticles (10 can be found); sexual dimorphism in the pedipalps; pedipalpal femur with 6 dorsal spines (5 can be found) and 6 ventral (5 can be found in females), tibia with 7 dorsal spines (6 can be found) and 4 ventral (3 can be found), and distitarsus with polymorphism in the spines; leg femur lengths: I > III > II > IV; body length up to 16 mm; male gonopod with lobus dorsalis in shape of a large claw; edges of the female gonopods with a small fold and a bottleneck below these.

Charinus jibaossu new species
(Figs. 1–21)

Type material.—Male holotype: BRAZIL: *Minas Gerais*: Gruta da Cazanga (20°17′06.58″S, 45°35′47.45″W), Arcos, 11 June 2011, R.L. Ferreira (MNRJ 09257). Paratypes: BRAZIL: *Minas Gerais*: 1 ♂, same data as holotype (ISLA 3835); 1 ♂, same data as holotype except 31 January 2009, R.A. Zampaulo (MNRJ 09258); 1 ♂, Gruta Branca (20°17′06.67″S, 45°35′47.39″W), Arcos, 31 January 2009, R.A. Zampaulo (ISLA 483); 1 ♂, Arcos, 10 August 2008, I.G.S. Soares (MNRJ 09205); 2 ♀, Arcos, 16 March 2012, I.G.S. Soares (MNRJ 09206); 1 ♂, 1 ♀, Abismo Satélite cave (20°36′31.51″S, 45°56′55.57″W), Arcos, R. L. Ferreira (CAVAISC); 2 ♂, 1 juvenile, Arcos, 10 October 2011, F. Bondezan (MNRJ 09187); 2 ♀, Abrigo Caneleira I e II (20°18′48.49″S, 45°35′43.80″W), Arcos, R.L. Ferreira (MNRJ 09095); 1 ♀, Gruta do Índio (20°19′07.33″S, 45°36′07.95″W), Arcos, R.L. Ferreira (MNRJ 09096); 1 ♂, 3 ♀, Meandro de Posse Grande cave (20°19′56.31″ S, 45°35′53.96″W), Arcos, 11 February 2006, R.L. Ferreira (MNRJ 09097); 1 ♂, Arcos, 25 January 2012, Mineração Belocal (MZUP 46336); 1 ♂, Gruta da Mineração (20°19′56.60″S, 45°36′45.29″W), Pains, 25 January 2009, R.A. Zampaulo (ISLA 480); 3 ♀, Gruta da Vila Corumbá (20°19′55.8″S, 45°36′43.23″W), Pains, 25 January 2009, R.A. Zampaulo (ISLA 482; ISLA 3830; MNRJ 09217).

Etymology.—The epithet *jibaossu* (Jibaoçu) is from the Tupi-Guarani word (Indian Brazilian language), meaning those of large arms. This noun is to be treated as a noun in apposition.

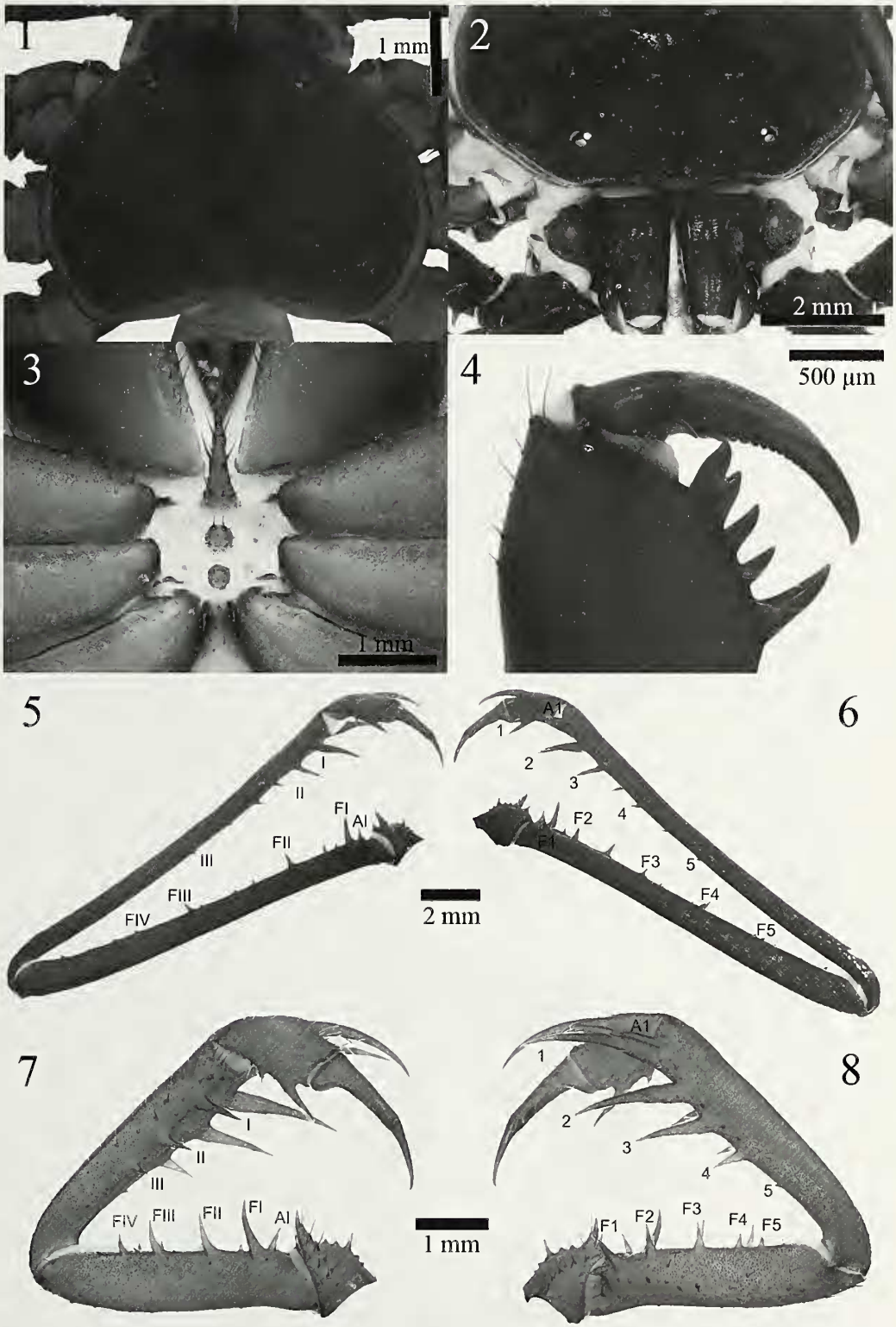
Description.—*Carapace* (Figs. 1, 2): Flattened. Ratio length/width slightly less than 3/4. Frontal area with several fine setae; anterior margin rounded with fine setae and corners slightly flattened down; six strong setae on the anterior margin upwards, the central two usually directly in front of the median eyes tubercle. Frontal process triangular in shape, with pointed apex, longer than wide and dorsally visible to the carapace; basal portion with setae. Carina begins at the corners of the anterior margin and extends from coxae of leg II to the corners of the posterior margin. Median eyes and tubercle developed; tubercle low, slightly divided between the two median eyes, with two posterior setae; lateral eyes developed, with internal pigmentation and 1 seta posterior to every triad. Frontal hump on each side, beginning just behind the lateral eyes and reaching a deep depression (fovea) posterior to the center; two pair of furrows radiate from the fovea; the first follows toward the anterior region near the hump, and the second follows in posterior orientation; small transverse depression on each side of the carapace between the radiations of these two pairs of furrows; a thin furrow follows medially from the median eye tubercle, crosses the fovea, and reaches the posterior margin. Punctuations more dense in the anterior region, in lines and spots on the sides, and less densely arranged next to the fovea region.

Sternum (Fig. 3): Tri-segmented with all segments sclerotized and convex. Tritosternum projected anteriorly, elongated and cone-shaped, with a large variation in the pattern of strong setae: 1 apical (1 pair is usually found), 2 median (1 pair can be found or be absent), 3 basal (1 or 2 can be found), and several small setae along the segment. Second segment (tetrasternum) rounded, with 1 upper pair of strong setae and several setulae encircling the base (in some specimens the upper pair of setae do not differs in size from the basal setae). Third segment (pentasternum) rounded, with 1 upper pair of strong setae and several setulae encircling the base (in some specimens the upper pair of setae is similar in size to the basal setae). The segments are separated from each other by approximately 0.5 diameter of the pentasternum.

Abdomen: Oblong, thinner than the carapace, with punctuations distinguishable.

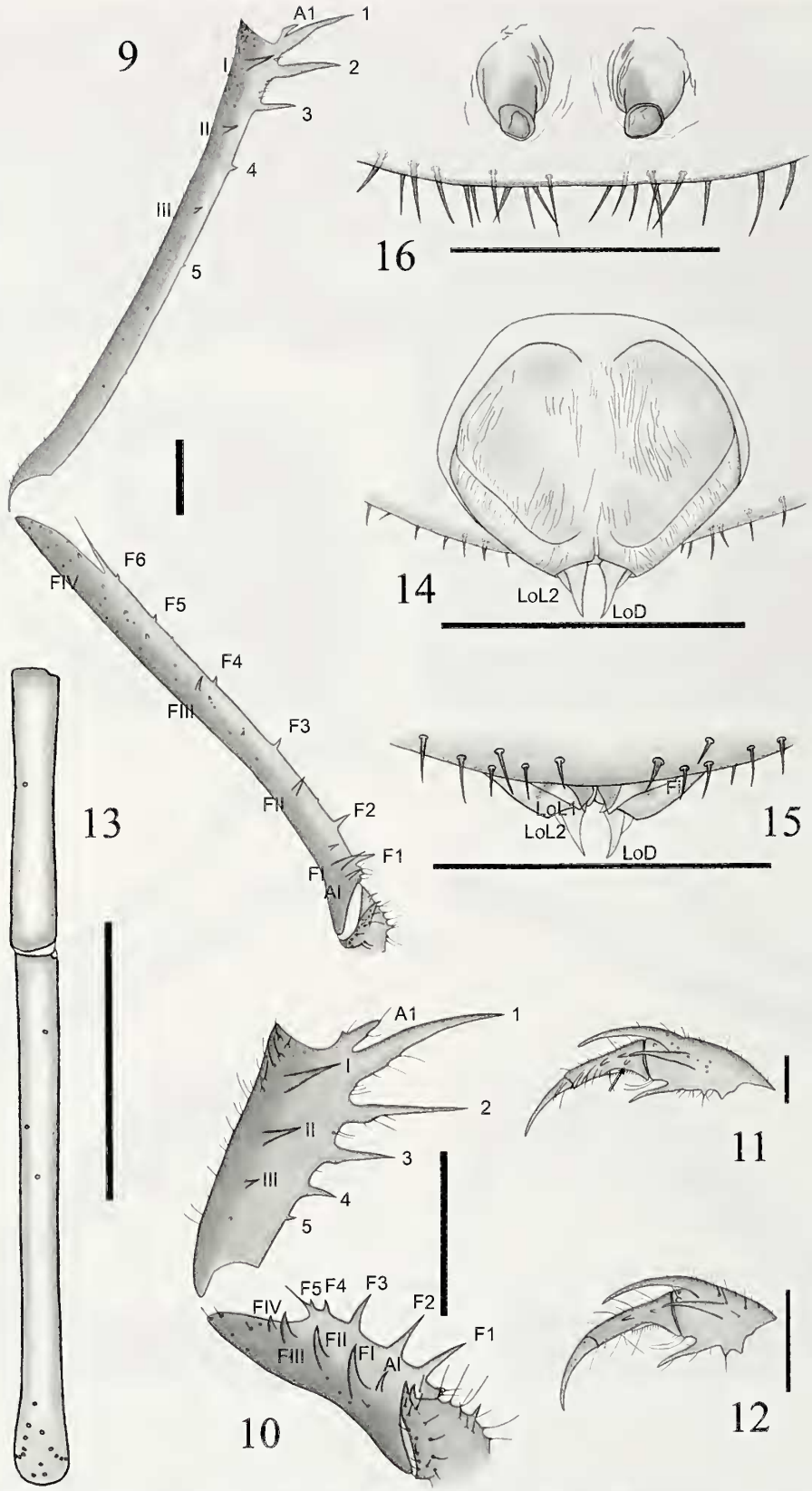
Chelicera (Fig. 4): Cheliceral furrow with 4 inner teeth. The distal tooth is bifid, the distal cusp being larger than the proximal. Teeth length: IV > Ia > Ib = II > III. Claw with 12 denticles (10 can be found), the basal ones being wider. Strong setae distally on dorsum of the cheliceral body.

Pedipalp (Figs. 5–12): Trochanter: Ventral spiniform apophysis pointed forwards with a series of strong setiferous tubercles. Two spines of subequal size aligned on the prolateral face, the first being near of the medial region and the second above the projection of the apophysis and near the femur. Three setae aligned between the spines and 2 basal to the first spine. Dorsal oblique series of strong setae. Femur: Strong dorsal setae. Three large setiferous tubercles dorsal (2 can be found) and some smaller in the basal region. Wide variation in the amount and position of reduced spines. Primary dorsal series with 6 spines (5 can be found) decreasing in size, with the spine I located after the basal tubercles. Secondary dorsal series with up to 3 reduced spines between the primary. Primary ventral series with 6 spines (5 can be found in females) of sizes: FI > FII > AI = FIII > FIV > FV in males and FI > FII > FIII > AI = FIV > FV in females. Secondary ventral series with up to 6 reduced spines between

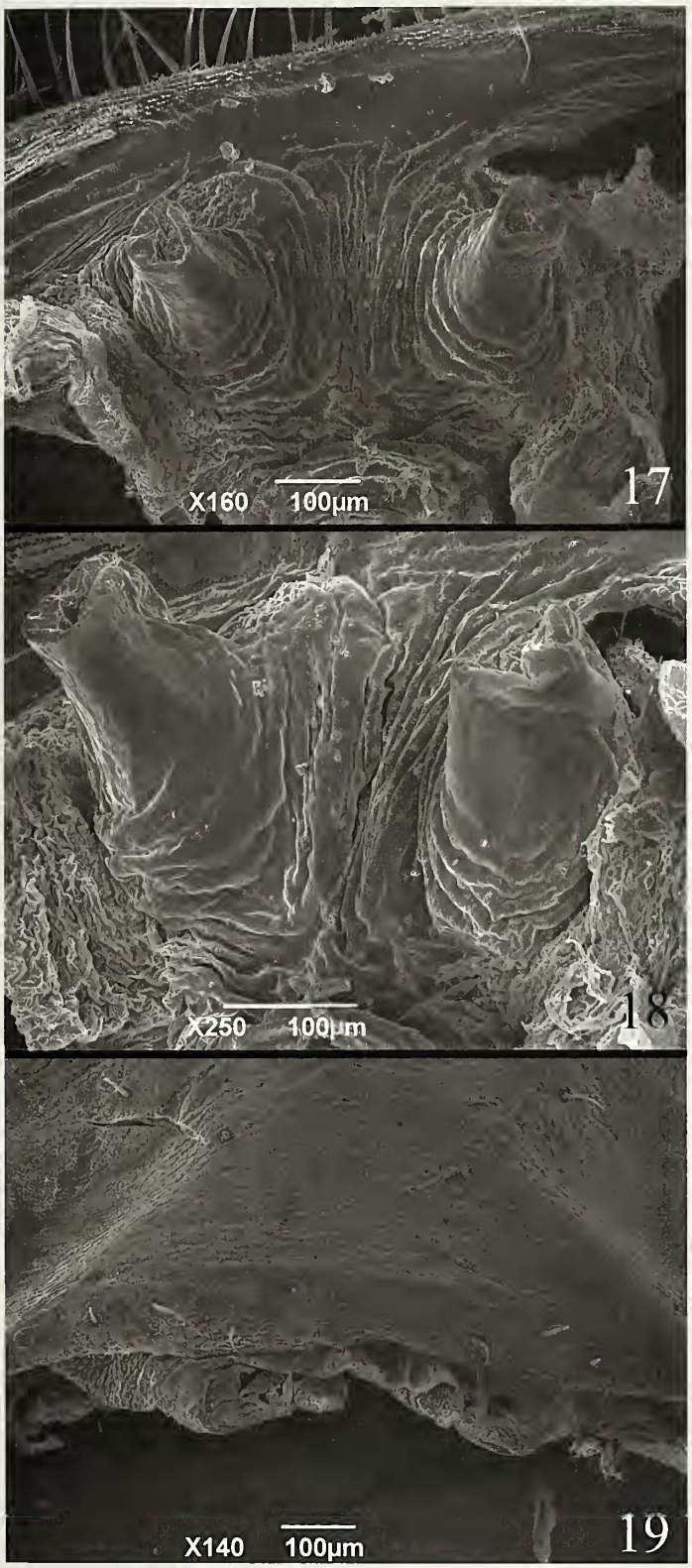


Figures 1–8.—*Charinus jibaossu* new species: 1. Carapace (female paratype); 2. Frontal process (holotype); 3. Sternum (holotype); 4. Teeth and denticles of the left chelicera (male paratype); 5. Ventral view of the right pedipalp (holotype); 6. Dorsal view of the right pedipalp (holotype); 7. Ventral view of the right pedipalp (female paratype); 8. Dorsal view of the right pedipalp (female paratype).

the primary series of spines in the male and 3 in the females. Tibia: Strong dorsal setae. Seven dorsal spines (6 can be found) of sizes: 1 > 2 > 3 > AI > 4 > 5 > 6; the last two are reduced. Strong ventral setae located distally. 3 ventral spines on distal half in descending order of size, with a basal one very reduced (can be absent). Basitarsus (Figs. 11, 12): Strong dorsal setae. Two dorsal spines, the II being approximately twice as large as I. One strong ventral setiferous tubercle on the basal portion. One ventral spine in the distal half of size slightly smaller than the dorsal spine I. Distitarsus (Figs. 11,



Figures 9–16.—*Charinus jibaossu* new species: 9. Trochanter, femur, and tibia of the right pedipalp (holotype); Scale bar = 2 mm; 10. Trochanter, femur, and tibia of the right pedipalp (female paratype); Scale bar = 2 mm; 11. Dorsal view of the right basitarsus, distitarsus, and tarsal claw of the pedipalp (holotype), the first spine is indicated; Scale bar = 1 mm; 12. Dorsal view of the right basitarsus, distitarsus, and tarsal claw of the pedipalp (female paratype); Scale bar = 1 mm; 13. Arrangement of trichobothria on the last segment of the basitibia and on the distitibia of right leg IV (holotype); Scale bar = 2 mm; 14. Dorsal view of the genitalia (male paratype); Scale bar = 500 μm; 15. Ventral view of the genitalia (male paratype); Scale bar = 500 μm; 16. Dorsal view of gonopods (female paratype); Scale bar = 500 μm. The following abbreviations are used: Fi = fistula (gonopod tube), LoD = lobus dorsalis, LoL1 = lobus lateralis primus, and LoL2 = lobus lateralis secundus.



Figures 17–19.—*Charinus jibaossu* new species: 17. Gonopod of female in dorsal view; 18. Gonopod of female in side view; 19. Gonopod of male in ventral view.

12): Several strong dorsal setae and long ventral setae. Wide variation in the number of spines. Three or 2 spines (1 or 4 can be found) dorsal of the cleaning organ in ascending order of size. Cleaning organ occupies about half of the length of article. Claw (Figs. 11, 12): Long with sharp curved tip.

Legs: All densely setose. Femur lengths: I > III > II > IV. Leg I: Tibia with 23 articles and tarsus (basitarsus+distitarsus) with 41 articles. Leg IV (Fig. 13): Basitibia with 4 pseudo-articles and 1 medial trichobothrium on the last article. Distitibia with 3 basal and 15 distal trichobothria; frontal and caudal series with 6 trichobothria each. Basitibia-distitibia length: BTI > DT > BT4 > BT3 > BT2. Ratio distitarsus/basitarsus approximately 5/6. Distitarsus composed of 4 segments.

Color: Live specimens exhibit a pattern of grayish brown coloration (Figs. 20B, 20D). In alcohol (Figs. 1–8): Adult males with intense reddish brown coloration on the carapace, pedipalps, and chelicerae, with legs slightly lighter. Abdomen grayish dorsally and yellowish ventrally. Dark spots can be observed in larger specimens on the dorsum of the chelicera. A clear round spot is found on the dorsum of the coxae of the pedipalps of the two larger males. Females and smaller specimens have a pattern of more yellowish coloration on the carapace, pedipalps, chelicerae, legs, and sometimes on the abdomen.

Genitalia: Male (Figs. 14, 15, 19): Margin of genital operculum rounded with a few scattered setae. Genitalia rounded, with short longitudinal splitting. Fistula (gonopod tube) exceeds the genital operculum margin. Sclerotized band in each side of the ventral portion of fistula. Lobus dorsalis claw-like protruding from each side of fistula, with a slight sclerotization at its apex and curved to one another. Lobus lateralis secundos emerges from fistula in the sides of lobus dorsalis. Lobus lateralis primus emerges in the sides of the lobus lateralis secundos (Fig. 19). Lamina medialis and processus internus emerge ventral to fistula in two pair of triangular projections, lamina medialis smaller, claw-shaped and sclerotized, and processus internus wider and lamellar. Female (Fig. 16–18): Genital operculum margin rounded with several strong setae. Gonopods sucker-like, cone shaped, and longer than wide. Gonopod openings rounded, edges with a small fold and a bottleneck below these. Gonopods separated from one another approximately by the diameter of each structure and distant from the margin of the operculum by a distance near its length. Scleroses in central sides of the bases, and between the middle area and the apex of each gonopod.

Natural history and threats.—The specimens examined for this study came from collections taken from caves located in the karst province of Arcos/Pains/Doresópolis in Minas Gerais state (Fig. 20A). All collection localities are from a limestone formation called "Bambuí" group, dating from the late upper Proterozoic (Auler et al. 2001).

According to the Köppen climatic classification, the area is Cwa (warm temperate clime – mesotermic) with rainy summers and dry winters. Its average annual precipitation is around 1,350 mm, concentrated mainly between the months of December and February, and the annual temperature average is 20.7°C.

Although the karst area of Arcos/Pains/Doresópolis is large and includes hundreds of caves, *Charinus jibaossu* is restricted

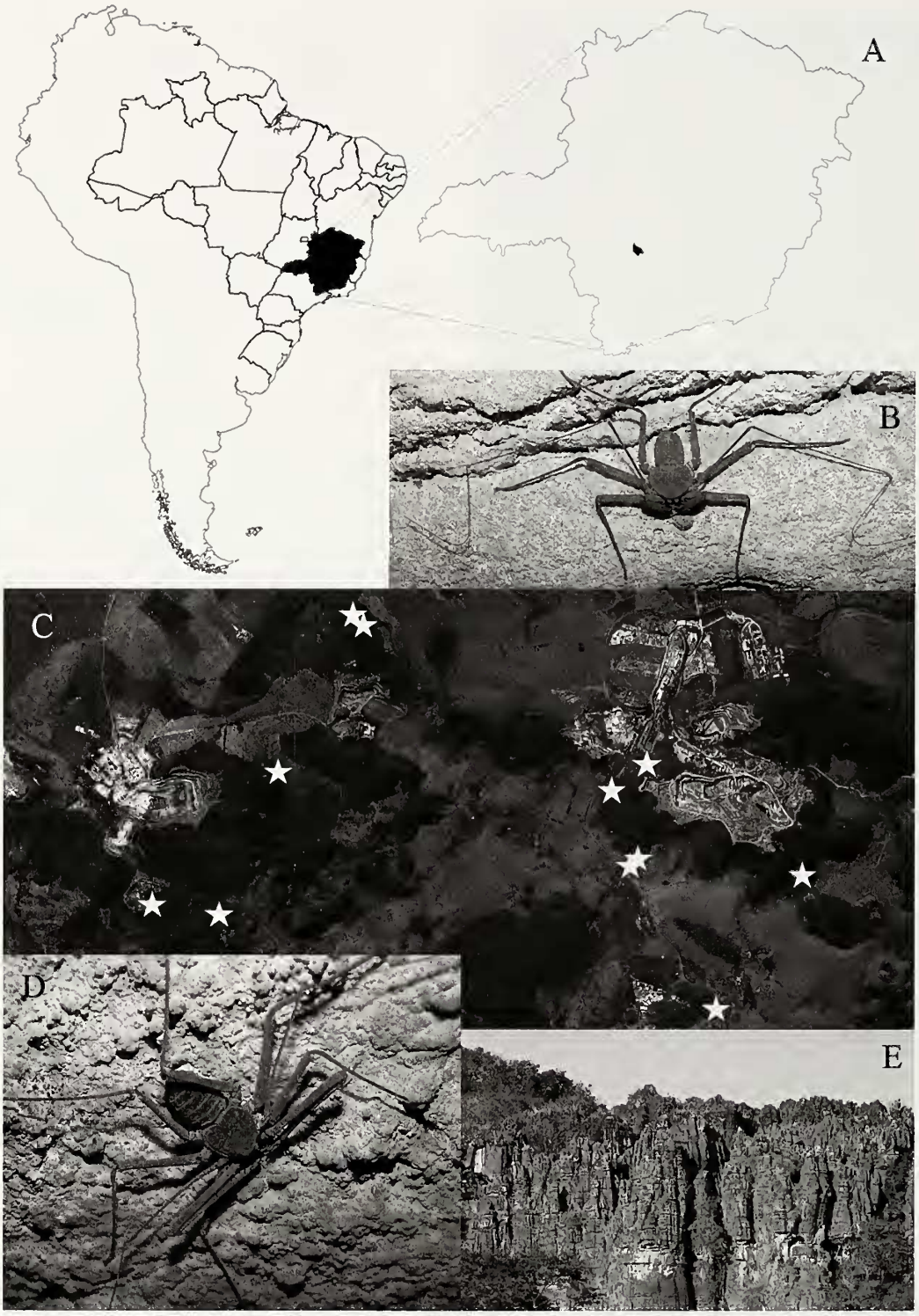
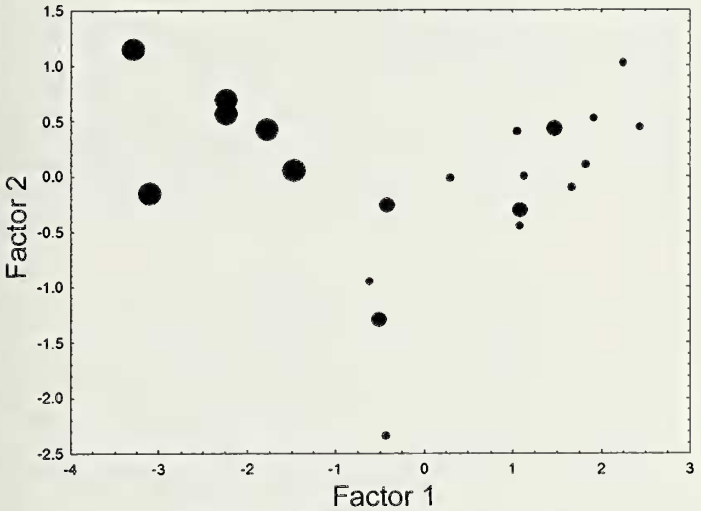


Figure 20.—A. Location of karstic province of Arcos/Pains/Doresópolis in the state of Minas Gerais, Brazil; B. Female of *Charinus jibaossu* inside the cave; C. Caves where *Charinus jibaossu* was found and surrounding areas with mining activities; D. Male of *Charinus jibaossu* inside the cave; E. Limestone formation.

to a small area in the northern portion of this province in the Arcos municipality. More than 400 caves were sampled in the entire province, but specimens of *C. jiboassu* were found only in 11 caves (Fig. 20C). Furthermore, the numbers in each cave were usually low (1–2 individuals), which might indicate that (i) the population densities are very low in each cave or, conversely, (ii) the caves are not the main habitat of the species, and only part of the population sheltered within caves. Specimens were usually found on the cave walls, and potential prey includes young crickets (*Endecous* sp. and *Eidmanacris* sp.), moths, and roaches that were also frequently seen in the caves where *C. jibaossu* specimens were observed.



Morphometric measures	F1	F2
Cephalotorax length	-0.680	-0.733
Cephalothorax width	-0.944	0.111
Length of the femur of the pedipalp	-0.969	0.200
Length of the tibia of the pedipalp	-0.967	0.207
% variance	80.7	15.8

Figure 21.—Principal Component Analysis (PCA) of morphometric measurements for analysis of sexual dimorphism of the *Charinus jibaossu*. Larger and medium circles = males; smaller circles = females.

An important aspect of the species habitat is that the caves where *C. jibaossu* were found are mostly dry caves, in contrast to the moist caves where most Brazilian species of *Charinus* normally live.

The external area where the species occur has been altered over time by human activities, especially by cattle ranching and limestone exploitation (Fig. 20C). Fortunately, the original forests still persist in areas unsuitable for agriculture or livestock due to the limestone outcrops (Fig. 20E). Such forests may be found to support populations of *C. jibaossu*, or at least provide organic resources for the caves. However, the mining activities are mainly focused on those outcrops so that the species certainly can be considered endangered.

Sexual dimorphism of *Charinus jibaossu*.—A Principal Components Analysis (PCA) was performed using the matrix of covariance of the log-transformed variables (cephalothorax length and width , and pedipalpal femur and tibia length), a usual procedure in analyses of morphological patterns in populations and communities (Manly 1986). The procedures of the Principal Components Analysis (PCA) reduced the four morphological measurements to two axes (Fig. 21). The variables width of the cephalothorax and lengths of the pedipalpal femur and tibia of the pedipalps were important in the first factor, which explained 80.7% of the variance observed among individuals. The lengths of the femur followed by the tibia were the most important variables in Factor 1 (Fig. 21).

Accordingly, we detected an evident sexual dimorphism for such traits in *C. jibaossu*. In males, the pedipalpal femur has an average length of 9.14 mm, and the pedipalpal tibia an average of 10.01 mm (Table 1). While in the females, the pedipalpal femur has an average length of 3.94 mm, and the pedipalpal tibia an average of 4.56 mm (Table 1). Weygoldt (2000) commented that as long as they are used for fighting, the elongated pedipalps of the male might confer selective advantages. Gross (1996) also argued that in most cases these types of alternative phenotypes are conditioned by a reproductive strategy favored in evolution.

Table 1.—Measurements (mm) of selected body parts of the specimens of *Charinus jibaossu* new species.

		Males (n = 11)	Females (n = 12)
Total length		13.02 (9.05–16.00)	12.06 (9.88–12.73)
Cephalothorax	Length	4.68 (3.67–5.48)	4.10 (3.00–6.23)
	Width	6.05 (5.08–6.80)	5.24 (4.48–6.38)
Pedipalp	Femur	9.14 (3.96–14.24)	3.94 (2.59–5.28)
	Tibia	10.01 (4.81–15.52)	4.56 (3.29–6.48)
	Basitarsus	2.06 (1.53–2.62)	1.69 (1.27–2.25)
	Distitarsus	1.43 (1.03–1.87)	1.27 (0.97–1.97)
	Tarsal claw	0.95 (0.61–1.22)	0.97 (0.62–1.32)

The cephalothorax width also explained morphometric differences between males and females. The average carapace width of males was 6.05 mm, and in females was 5.24 mm (Table 1). However, although such measurements have shown a separation between adult males and females in later developmental stages, this is not a characteristic that separates them clearly.

The PCA revealed four males with measurements similar to those observed in females. The specimens probably include recently matured adults that still do not have the full growth of their pedipalps as these increase allometrically in relation to the rest of the body parts such as carapace length (Weygoldt 2000).

DISCUSSION

Charinus jibaossu is the eleventh species of the genus described from Brazil and the second from the state of Minas Gerais. *Charinus jibaossu* differs from other Brazilian species in a number of characteristics, but particularly in body size. Along with *C. mysticus*, this group comprises the largest species in Brazil so far. According to Weygoldt (2000), the species of *Charinus* have a body length of up to 15 mm; however, some males of *C. jibaossu* exceed this value (Table 1). The pedipalps of *C. jibaossu*, as already mentioned, display distinctive sexual dimorphism (Figs. 20B, C), being extremely elongated in males, which make them even more robust when compared with other species of *Charinus*.

Sexual dimorphism is present in some species of Amblypygi (Weygoldt 2000). Among the species of the genus in Brazil, *C. asturius*, *C. brasilianus*, and *C. montanus*, also from the southeast region, exhibit sexual dimorphism in the pedipalps, but in *C. jibaossu* this is more pronounced.

Charinus jibaossu has similarities to other species of Brazil, such as *C. mysticus*, a species from the state of Bahia. The pattern of spines on the pedipalp and setae on the sternum of *C. jibaossu* is comparable to that observed in *C. mysticus*. Both speeies have the pedipalpal femur and tibia with a similar numbers of spines and the tritosternum with many strong setae. The spines of these pedipalpal segments and tritosternum setae were difficult to describe in general, as they vary widely. Since the pedipalps of *C. jibaossu* males lengthen after sexual maturity, the number of secondary spines can also inerease (Weygoldt 2000). The presence of only three spines in

the pedipalpal distitarsus also occurs only in these two species from Brazil.

Giupponi & Kury (2002) were the first to establish the presence of a third distitarsus spine in the pedipalp in *C. uuysticus*. Weygoldt (2005) verified the presence of the third spine in *C. uuadagascarieusis* Fage 1954 and *C. dluofareusis* Weygoldt et al. 2002, suggesting they were related species, but without commenting on the existence of three spines in *C. uuysticus*. *Charinus jibaossu* has this third accessory spine in the basal portion of the distitarsus of the pedipalps; however, an unprecedented variability of this character is verified. In one of the females, two spines were observed on the right pedipalp and only one on the left, while in a male, three spines on the left and four on the right. In some males, setiferous tubercles were observed positioned exactly in the same place as the third spine, indicating that they could become spines in larger individuals. Males with two spines and females with three were also observed, showing that the polymorphism is probably related to the size of the specimens.

Other similarities are found between *C. jibaossu* and *C. eleouorae*. These two species have the frontal process with a pointed apex, and a similar number of cheliceral denticles.

Weygoldt (2005, 2006, 2008) divided the *Charinus* species into three groups based on the morphology of the female gonopods: (i) group of *C. beugalensis* species, characterized by thin "finger-like" gonopods; (ii) the group of *C. brasilianus* species, characterized by "sucker-like" gonopods; and (iii) a group of *C. australianus* species, wherein the gonopods are flattened "cushion-like" structures. The gonopod of *C. jibaossu* corresponds to the *C. brasilianus* type, a group that includes most of the Brazilian species. Females of *C. jibaossu* have an opening with a small fold and a bottleneck located below this (Figs. 16–18). This type of morphology is also seen in *C. potiguar* and *C. uuysticus*; however, the gonopod of *C. jibaossu* is thinner. The genitalia of the male *C. jibaossu* has its secundus lobus lateralis claw-shaped (Figs. 14, 15), similar to that seen in the illustrations of *C. uoutauus*, *C. asturius* and *C. acaraje* (Weygoldt 1972; Pinto-da Rocha et al. 2002), yet it is markedly larger. The genital organ is rounded as in *C. acaraje*, but it has a much less pronounced longitudinal division than that of this species.

Although *C. jibaossu* apparently does not comprise a troglobitic species, its restricted distribution makes it highly vulnerable. In 2008, the Brazilian legislation that had formerly granted full protection to caves was amended (Decree-law n° 99,556 to Decree-law n° 6,640), so that caves are now susceptible to damage or destruction by various human activities such as mining. As for *C. jibaossu*, the evident alterations observed throughout its range, especially the expansion of mining activities, further raise the risks to this species.

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